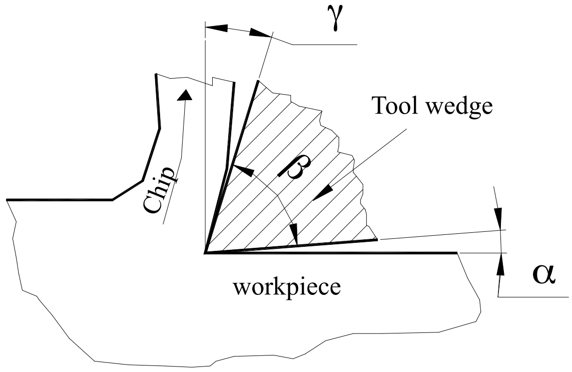
2 Fundamentals of production-Tool Geometry

.1 Basic concepts

For the tool to be able to cut without great friction, we have to ensure:

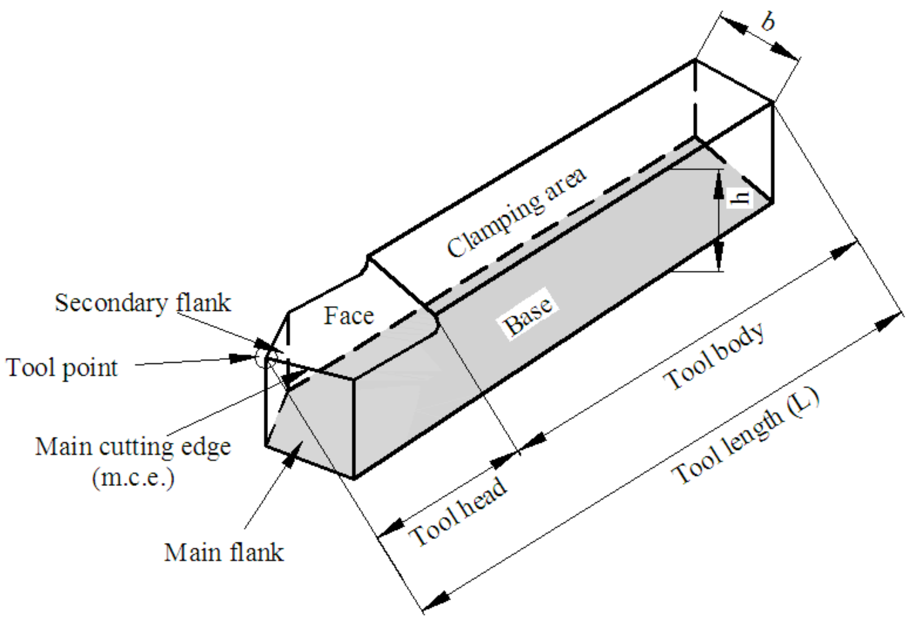
1. A clearance angle α between tool flank and cut surface to minimize friction.
2. A rake angle γ between tool face and chip direction to help for chip removal.
3. A resulting wedge angle β between tool face and flank which helps tool to penetrate through w.p.

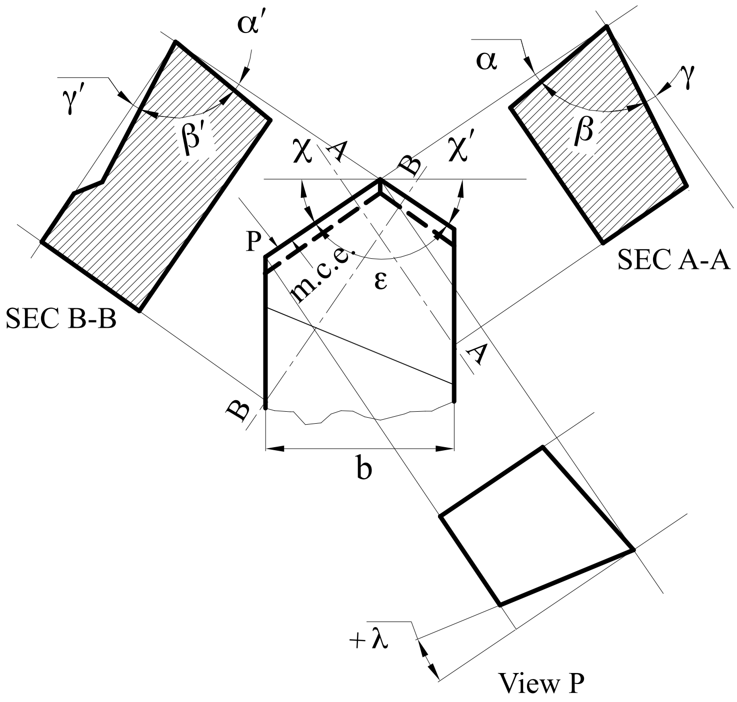


Note: Angle β must have an optimum value which ensures sufficient durability and strength of tool wedge and also sufficient tool conductivity.

.2 Main geometry of a single point tool

The main tool angles are determined and elaborated in the following drawings





Working drawing of a single point tool

Where:

δ Cutting angle (δ = α+β)

ε Nose angle

χ Setting angle

λ Main cutting edge inclination

.3 Choice of tool angles

The values of tool angles are chosen according to:

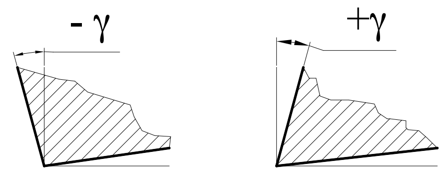
- The workpiece material
- The tool material
- The machining method
- Cutting conditions (v, s, t)
- Required Grad of accuracy (IT) and surface roughness (Ra).

Examples:

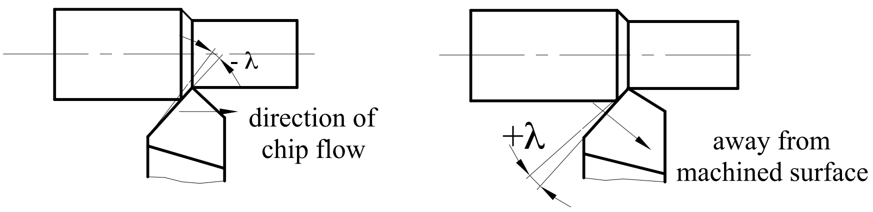
$\boldsymbol{\alpha}$**:** is influenced by tool material and amount of friction on tool flank. For hard material of wp and smaller $t \rightarrow \alpha \downarrow$. For HSS $\alpha = 5 - 8°$ and for SC $\alpha = 4 - 6°$.

$\boldsymbol{\beta}$**:** The harder and stronger wp material $\rightarrow \beta \uparrow$. For soft materials (Al) $\rightarrow \beta = 25 - 45$ ° and for hard and brittle material (CI) $\rightarrow \beta = 75 - 85$ °

γ The rake angle is +ve for ductile and tough materials and –ve for hard and brittle.



λ influences direction of chip flow.



r **(tool radius):**

$r\uparrow \rightarrow$ tool strength$\uparrow \rightarrow Ra\downarrow$ but $r\uparrow\uparrow \rightarrow P_y\uparrow\uparrow \rightarrow$ vibrations $\rightarrow Ra\uparrow$